REMARKS

Claims 1-20 and 36-46 are currently pending in the application. By this response, no claims are amended, added, or canceled. Reconsideration of the rejected claims in view of the following remarks is respectfully requested.

35 U.S.C. §103 Rejection

Claims 1-6, 8-20, 36, 37, 39, 41, and 43-46 were rejected under 35 U.S.C. §103(a) for being unpatentable over U.S. Patent No. 6,757,645 issued to Chang *et al.* ("Chang") in view of U.S. Patent No. 6,873,720 issued to Cai *et al.* ("Cai"). Claim 7 was rejected under 35 U.S.C. §103(a) for being unpatentable over Chang in view of Cai and further in view of U.S. Patent No. 5,965,306 issued to Mansfield *et al.* ("Mansfield"). Claims 38, 40, and 42 were rejected under Chang in view of Cai, and further in view of U.S. Patent No. 6,850,320 issued to Shibata *et al.* ("Shibata"). These rejections are respectfully traversed.

The examiner bears the initial burden of factually supporting any *prima facie* conclusion of obviousness. If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness. To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991). See MPEP

§2142. Applicants submit that no proper combination of the applied art teaches or suggests each and every feature of the claimed invention.

Chang in view of Cai

Claims 1-6, 8-20, 36, 37, 39, and 41

The present invention generally relates to the field of semiconductor manufacturing, and, more particularly, to a method for automating the evaluation and analysis of defects in masks used in the semiconductor manufacturing process to determine which defects would cause product failure. Exemplary non-limiting implementations of the invention provide for determining whether to accept, scrap, or repair a component by applying different acceptance rules to a defect depending upon the criticality of the defect. In this manner, the inspection process may be sped up by only applying more time-consuming critical acceptance rules to critical defects, while applying less time-consuming (i.e., less critical rules) rules to non-critical defects. Moreover, by applying different acceptance rules to different defects, fewer masks may be unnecessarily scrapped as failures. Independent claims 1, 11, 16, 19, and 36 all recite determining a final disposition of a component/mask by applying different acceptance rules to the critical defects and the non-critical defects. For example, claim 1 recites, *inter alia:*

> determining a final disposition of the component by applying different acceptance rules to the critical defects and the non-critical defects.

The applied references do not teach or suggest at least this feature. The Examiner, however, asserts that Chang discloses all of the features of the independent claims except for classifying the defects into critical defects and the non-critical defects based on the analyzing, and determining a final disposition of the component by applying different acceptance rules to

the critical defects and the non-critical defects. The Examiner is of the opinion that Cai teaches these features, and that it would have been obvious to modify Chang in view of Cai. Applicants respectfully disagree.

As previously discussed in the Amendment dated October 30, 2006, such that it does not require further elaboration herein, Chang discloses a mask inspection system. Chang does not, however, teach or suggest classifying the defects into critical defects and the non-critical defects based on the analyzing, and determining a final disposition of the component by applying different acceptance rules to the critical defects and the non-critical defects. Instead, Chang merely discloses that an operator looks at images to detect differences (i.e., defects).

Applicants submit that Cai does not compensate for the deficiencies of Chang with respect to the claimed invention. That is, Cai does not teach or suggest determining a final disposition of the component by applying different acceptance rules to the critical defects and the non-critical defects. Instead, Cai discloses the use of a single acceptance rule that applies to all defects.

The Examiner, on pages 2 and 4 of the Final Office Action dated January 11, 2007, asserts that Cai teaches applying different acceptance rules to critical and non-critical defects in lines 48-50 of column 9. Applicants respectfully disagree, and submit that the passage relied on by the Examiner merely refers to measuring the criticality of a particular defect, and does not teach or suggest *determining a final disposition of the component by applying different acceptance rules to the critical defects and the non-critical defects*, as recited in claims 1, 11, 16, 19, and 36.

In leading up to the passage relied on by the Examiner, Cai discusses identifying critical defects with respect to FIGS. 3, 4A, and 4B. With specific reference to FIGS. 4A and 4B, Cai

discloses that the magnitude of criticality (i.e., printability impact) of a defect is generally related to the density of the region (i.e., spacing of features in the region) that the defect is located in. More particularly, Cai teaches:

> In general, a defect typically has more impact in a crowded region than in a less-crowded region. Thus, a defect located in an area defined by features a distance X apart can have more printability impact than a defect located in an area defined by features distance Y apart, assuming that distance X is less than distance Y. (col. 9, lines 19-24).

However, Cai goes on to explain that this simplification does not always provide an accurate indication of the criticality of a defect. For example, with respect to FIG. 4B, Cai notes that defect 402 would be more critical to feature 405 than would be defect 401, even though defect 401 is in a more crowded area than defect 402. Thus, Cai surmises that:

> ... a general rule limited to the spacing of features does not provide an accurate indication of printability impact. (col. 9, lines 43-44).

Recognizing this flaw in any criticality rule limited only to the spacing of features, Cai expounds that plural design rules could be used to determine the criticality of a defect. For example, the criticality of a given defect could be determined upon spacing of features, size of the defect, and distance of the defect form a feature. More particularly, in the passage relied upon by the Examiner, Cai discloses that:

> One possible solution to this problem is to measure the distances to neighboring features (such as d1, d2, and d3) from each defect (such as defects 401, 402, and 403, respectively). These distances in combination with a measurement of the size of the defect could be factored into a plurality of design rules to provide the printability impact. However, this analysis is computationally intensive, thereby increasing the time required to provide meaningful information to the customer. Moreover, even if the size of the defect and the distance of the defect from the neighboring feature are known, the actual impact of the defect on the

> neighboring feature cannot fully be predicted by mere inspection of the mask. (lines 45-57 of col. 9)

Applicants submit that, contrary to the Examiner's assertion, this passage does not teach or suggest *determining a final disposition of the component by applying different acceptance rules to the critical defects and the non-critical defects*, as recited in the claims 1, 11, 16, 19, and 36. In fact, this passage does not even teach or suggest the use of an acceptance rule. Instead, when read within the context of the preceding description of FIGS. 3, 4A, and 4B (i.e., line 46 of column 8 through line 44 of column 9), it is clear that the plurality of design rules would be used for evaluating the criticality (i.e., printability impact) of a particular defect. Applicants submit that determining the criticality of a particular defect is not the same as determining a final disposition of a component, as recited and described in the instant invention. Instead, the criticality of a particular defect is merely a factor that may be included in an acceptance rule; but the criticality is not, in and of itself, an acceptance rule. Thus, the plurality of design rules disclosed in lines 48-50 of column 9 of Cai, and relied upon by the Examiner, are not acceptance rules. Therefore, the applied reference cannot arguably teach or suggest *determining a final disposition of the component by applying different acceptance rules.*

Furthermore, even assuming *arguendo* that the plurality of design rules discussed in the above-noted passage of Cai do constitute acceptance rules, which Applicants do not concede, there is no teaching of *applying different acceptance rules to critical defects and non-critical defects*. Instead, Cai merely states that a plurality of design rules may be used to provide the printability impact. However, Cai does not describe how such a plurality of design rules would be applied. That is, Cai does not teach or suggest applying different rules of the plurality of design rules to critical and non-critical defects. In fact, Cai makes no mention whatsoever of a

distinction between critical and non-critical defects with respect to the application of the above-noted plurality of design rules. Thus, Cai and Chang, alone or in combination do not teach or suggest each and every feature of claims 1, 11, 16, 19, and 36.

Notwithstanding Cai's disclosure of plural design rules for determining printability impact of a defect, Applicants submit that Cai explicitly teaches the application of a single acceptance rule to all of the defects of a mask. For example, as previously discussed in the Amendment dated October 30, 2006, Cai teaches that each individual defect has a numerical tolerance (TCD) associated with it based upon its location in the mask. Defects in more critical areas have a higher TCD value and defects in less critical areas have a lower TCD value. But regardless of the TCD value, each assigned TCD is a variable in an equation that produces a defect severity score (DSS). Based upon the DSS, the entire mask is either accepted, repaired, or scrapped (col. 5, lines 21-58; col. 13 – col. 18). Thus the DSS is an acceptance rule; whereas, the TCD, on the other hand, is a numerical measure of the criticality of a single defect. Thus, an individual defect is not accepted or rejected based upon its TCD. Instead, all of the TCD's factor into the calculation of the DSS, which is the single acceptance rule for the mask. Therefore, Cai does not teach or suggest determining a final disposition of the component by applying different acceptance rules to the critical defects and the non-critical defect as recited in the claimed invention.

Moreover, there is no motivation to combine the references as suggested by the Examiner because Cai teaches away from the suggested combination. The above noted passage of Cai clearly teaches away from classifying the defects into critical defects and non-critical defects and using a plurality of design rules because of the time required for intensive computation. The Examiner even recognizes this in the outstanding Office Action. Instead, Cai discloses using the

above-discussed single acceptance rule (i.e., the DSS) for all of the defects, regardless of their location on the mask. Thus, Cai expressly teaches away from the features that are lacking in Chang (i.e., classifying the defects into critical defects and non-critical defects, and determining a final disposition of the component by applying different acceptance rules to the critical defects and the non-critical defects). Therefore, there is no motivation to combine the references as suggested by the Examiner, and the rejection is improper and should be withdrawn.

In the Response to Arguments section of the final Office Action dated January 11, 2007, the Examiner asserts that:

> Although Cai discloses that this is computationally intensive to apply different rules, the Examiner does not consider this as teaching away from using different rules since it implies that it can be done. Teaching away would only be if Cai were to disclose that multiple rules could not be used, which is not the case. (Final Office Action, page 2).

Applicants respectfully disagree, and submit that a reference does not have to show impossibility of a combination to teach away from the proposed combination. MPEP §2141.02 provides the following guidance on prior art disclosures that teach away from the claimed invention:

> A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).
> ...
>
> However, "the prior art's mere disclosure of more than one alternative does not constitute a teaching away from any of these alternatives because such disclosure does not criticize, discredit, or otherwise discourage the solution claimed...." *In re Fulton*, 391 F.3d 1195, 1201, 73 USPQ2d 1141, 1146 (Fed. Cir. 2004).

Thus, according to MPEP §2141.02, in order to teach away from a proposed combination, a prior art reference need only criticize, discredit, or otherwise discourage the proposed combination. The prior art reference need not, as the Examiner seems to think, show that the proposed combination cannot be used or accomplished. Cai expressly discourages the use of plural design rules by stating:

> However, this analysis is computationally intensive, thereby increasing the time required to provide meaningful information to the customer. Moreover, even if the size of the defect and the distance of the defect from the neighboring feature are known, the actual impact of the defect on the neighboring feature cannot fully be predicted by mere inspection of the mask. (lines 51-57 of col. 9).

Therefore, Applicants repeat the position that Cai expressly teaches away from the combination proposed by the Examiner. And because Cai teaches away from the proposed combination, there is no motivation, other than Applicants' own disclosure, to modify Chang as asserted by the Examiner.

For all of the above-noted reasons, Applicants submit that no proper combination of Chang and Cai renders obvious the invention recited in independent claims 1, 11, 16, 19, and 36.

Moreover, Applicants submit that claims 2-6, 8-10, 12-15, 17, 18, 20, 37, 39, and 41 each depend from one of allowable independent claims 1, 11, 16, 19, and 36, and are allowable by virtue of the allowability of the respective independent claims. Also, the applied references do not teach or suggest many of the features of the dependent claims.

Claims 43-46

Claim 43 recites, among other features:

> ...reading a first rule from a predetermined rule set of a plurality of rules; and

> determining whether to repair, accept, or scrap the component based upon the defect by applying the first rule to the generated shape.

The Examiner asserts the proposed combination of Chang modified in view of Cai, discussed with respect to claim 1, teaches or suggests these features. Applicants disagree.

As discussed above, Cai does not teach or suggest a plurality of acceptance rules. Instead, Cai teaches the use of a single acceptance rule (i.e., the DSS) that is used to determine whether to repair, accept, or scrap the component. Contrary to the Examiner's assertion, the plurality of design rules disclosed at line 50 of column 9 are not used to determine whether to repair, accept, or scrap the component. In fact, Cai makes no mention that the plurality of design rules disclosed at line 50 of column 9 could be used to determine whether to repair, accept, or scrap the component. Instead, the plurality of design rules disclosed at line 50 of column 9 are only described as being used for determining printability impact. Determining printability impact of a defect, however, is not the same as determining whether to repair, accept, or scrap the component based upon the defect. Therefore, Cai cannot arguably teach determining whether to repair, accept, or scrap the component based upon the defect by applying the first rule (from a predetermined set of a plurality of rules) to the generated shape, as recited in claim 43.

Moreover, Applicants submit that claims 44-46 depend from of allowable independent claim 43, and are allowable by virtue of the allowability of the independent claim. Also, the applied references do not teach or suggest many of the features of the dependent claims. For example, none of the applied references teach or suggest determining whether to repair, accept, or scrap the component based upon the defect by applying first and second rules to the same generated shape, as required in claim 46.

Accordingly, Applicants respectfully request that the rejection over claims 1-6, 8-20, 36, 37, 39, 41, and 43-46 be withdrawn.

Claim 7 in view of Chang, Cai, and Mansfield

The Examiner is of the opinion that it would have been obvious to the skilled artisan to combine the Chang, Cai, and Mansfield, and that the resulting combination shows all of the features of the claimed invention. Applicants respectfully disagree.

Claim 7 depends indirectly from allowable independent claim 1. As described above, Chang and Cai do not teach or suggest all of the features of claim 1. Mansfield does not compensate for the deficiencies of Chang and Cai with respect to claim 1. Therefore, no proper combination of the applied references teaches or suggests all of the features of the claimed invention.

Accordingly, Applicants respectfully request that the rejection over claim 7 be withdrawn.

Claims 38, 40, and 42 in view of Chang, Cai, and Shibata

The Examiner is of the opinion that it would have been obvious to the skilled artisan to combine the Chang, Cai, and Shibata, and that the resulting combination shows all of the features of the claimed invention. Applicants respectfully disagree.

Each of claims 38, 40, and 42 depend from allowable independent claims 1, 11, and 16, respectively. As described above, Chang and Cai do not teach or suggest all of the features of claims 1, 11, and 16. Shibata does not compensate for the deficiencies of Chang and Cai with respect to claims 1, 11, and 16. Shibata discloses adjusting the sensitivity of a defect detecting device to eliminate false detections of defects. The sensitivity is adjusted based in part upon the criticality of the region of the chip, which may be inferred from design rules. However, similar

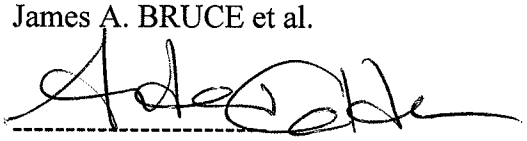
to Cai, these design rules are related to the criticality of the region of the chip, and are not acceptance rules for determining whether to accept, repair, or scrap a component. As such, Shibata does not teach or suggest *determining a final disposition of the component by applying different acceptance rules to the critical defects and the non-critical defects*, as required by claims 38, 40, and 42.

Accordingly, Applicants respectfully request that the rejection over claims 38, 40, and 42 be withdrawn.

CONCLUSION

In view of the foregoing remarks, Applicants submit that all of the claims are patentably distinct from the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue. The Examiner is invited to contact the undersigned at the telephone number listed below, if needed. Applicants hereby make a written conditional petition for extension of time, if required. Please charge any deficiencies in fees and credit any overpayment of fees to Attorney's Deposit Account No. 09-0456.

Respectfully submitted,
James A. BRUCE et al.



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